CASE STUDY REPORT #54
NEW EXCHEQUER
MERCED RIVER

I. Project Description

The drainage area of the Merced River above the New Exchequer Dam consists of 1,035 square miles of mountainous and foothill lands, a large portion of which is within the heavy snowpack regions of the Sierra Nevada. The Merced River watershed above New Exchequer Dam originates at the crest of the Sierra Nevada within the boundaries of Yosemite National Park.

McClure Reservoir impounded by New Exchequer Dam is located on the Merced River seven miles east of Merced Falls (see Figure 1). The original dam was constructed by the Merced Irrigation District in 1926. The New Exchequer Dam, located less than one mile downstream from the original dam increased the storage capacity in 1966 from 289,000 acre-feet to 1,020,000 acre-feet covering 7,127 acres.

Approximately three miles below New Exchequer Dam the Merced Irrigation District constructed McSwain Dam in 1966. This dam impounds 9,730 acre-feet of water covering 312 acres and is operated to modulate the release from New Exchequer.

Releases from the New Exchequer Dam are diverted ten miles downstream by MID's main canal at the Crocker-Huffman Diversion Dam. This small dam was built by the MID in 1910 and has been proposed for enlargement (Snelling Project, Case Study #55).

All features of the New Exchequer Project were constructed and are operated by the Merced Irrigation District for the purpose of flood control, power production and irrigation.

Figure 1
LOCATION MAP

Source: California Department of Fish and Game, 1974.

NEW EXCHEQUER DAM
MC SWAIN DAM
MERCED FALLS DAM
SNELLING
CROCKER - HUFFMAN DAM
Snelling Road Bridge
Highway 59 Bridge
Shaffer Bridge
Highway 99 Bridge
TURLOCK
MERCED RIVER
CRESSEY
George Hatfield State Park
Stevinson Flow Gauge
STEVINSON
MERCED
NEWMAN
SAN JOAQUIN RIVER
443

Scale In Miles
0 5 10 15
0 5 10 15 20 25
Scale In Kilometers

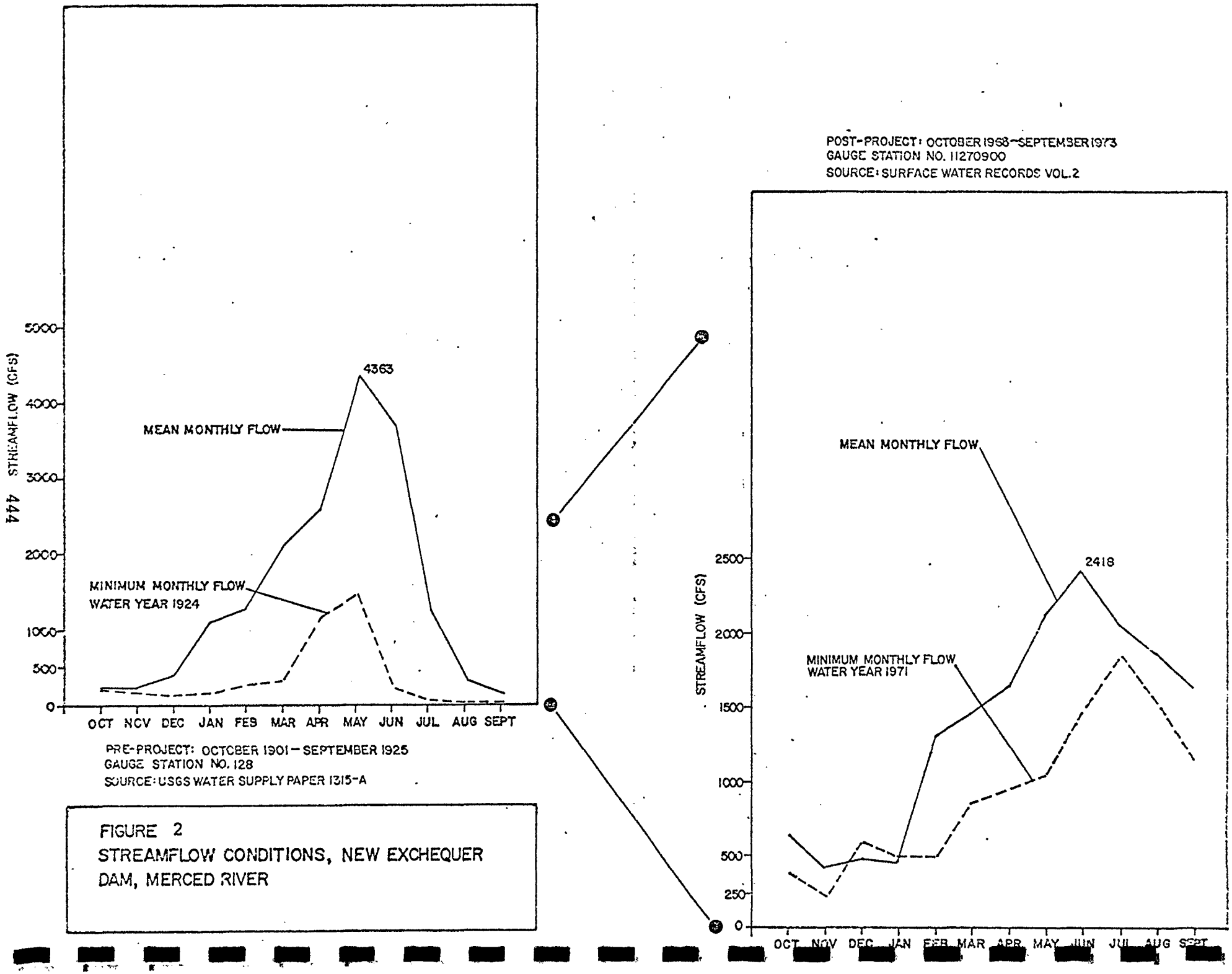


FIGURE 2
STREAMFLOW CONDITIONS, NEW EXCHEQUER DAM, MERCED RIVER

II. Pre-Project Condition

The Merced River has a seasonal distribution of stream flow discharge typical of other rivers draining into the San Joaquin Valley. Peak flows averaging 4,300 cfs occur during May at the time of heavy snowmelt. Prior to construction of the original Exchequer Dam there were no large storage reservoirs that significantly reduced the magnitude of the spring runoff in the river's watershed.

During the time period prior to the construction of New Exchequer there was no set amount of water provided for fish and flows varied from less than 30 cfs to more than 6,800 cfs at flood stage.

Historically the Merced River supported populations of spring and fall run king salmon that averaged 12,000 fish per year. The salmon run on the Merced River declined and was in poor condition for at least twenty years prior to the New Exchequer Project. The abundance of fall river king salmon in the three years prior to the project is shown below:

Year	Estimated Number of Adult Spawners (DFG, 1974)
1964	40
1965	90
1966	40

The Department of Fish and Game (1965) estimated that there are 62 stream miles of king salmon spawning habitat in the Merced River drainage. About 25 miles of stream contains good spawning

gravels and the lower section is only used for transportation. Croker-Huffman Dam is essentially the upstream limit of any significant spawning migration. A fish ladder is provided at the dam, but salmon rarely ascended over it. Gravel diversions on the lower section of the river (below Crocker-Huffman Dam) blocked migration during periods of low instream flow. Another major factor contributing to the pre-project decline of the king salmon run was the mining and removal of gravel from spawning areas (DFG, 1965).

The Merced River supports a resident mixed fishery with smallmouth bass and rainbow trout present in the project area. Non-game species were also present as demonstrated by a 1964 preimpoundment chemical treatment of the entire drainage above the New Exchequer Dam. During the treatment it was found that non-game fish comprised 90 percent of the biomass in the river section immediately above New Exchequer Dam impoundment.

III. Project Development

The original Exchequer project (1923) had not given any official consideration to maintenance of fishlife below the dam, blocked the upstream migration of fish, and had inundated salmon spawning areas in the Merced River.

It was not until 1954 that the DFG was presented with an opportunity to establish minimum streamflows for the maintenance of fishlife in the Merced River. At this time the Merced District filed applications (nos. 16186 and 16187) for permits to appropriate unappropriated water from the Merced River which were

protested by the DFG. The applications are for the storage of 900,000 acre-feet per annum and for power production at Exchequer Dam, Bagby Dam and Snelling Dam (the latter two dams were never built.) Water released from storage was to be used at the District's existing Northside and main canals.

In order to dismiss the DFG's protest, the Merced Irrigation District entered into an agreement with the Department of Fish and Game in October of 1959. This agreement was included in the terms of the water rights permit issued in 1960 to the MID by the State Water Resources Control Board (Decision 976).

The following release schedule concerning the operation of the New Exchequer Dam was incorporated into the terms of the 1959 agreement.

Normal Year	-	50 cfs
Dry Year	-	25 cfs

(Definition of a dry year - when the unimpaired runoff is less than 450,000 acre-feet from April 1 to July 31.)

These flows were designed to maintain resident fishlife along the 10 mile reach between New Exchequer and the proposed Snelling Dam.

The 1959 agreement included other terms which required the operation of the proposed dams for the maintenance of a stable flow regime and a temperature regime suitable for salmonid reproduction along with a release schedule for the proposed Snelling Dam which would be the upstream limit for anadromous fish migrations (see Case Study #55).

In 1964 the Federal Power Commission issued a 50 year license (FPC project No. 2179) for the Merced Irrigation Districts' Snelling-New Exchequer Projects. The terms of this license include the 1959 DFG agreement and a vegetation retension plan for the reservoir.

In October 1966 at the time that New Exchequer and McSwain Dams were completed a king salmon enhancement contract was initiated between the California Department of Water Resources and the Merced Irrigation District under the Davis-Grunsky Act (contract No. D-66-R17). This act provides a public agency with a grant for the part of the construction costs of the proposed project that is allocated to the enhancement of fish and wildlife or for recreational interests. (Grants applied toward these specific costs cannot exceed 50 per cent).

The provision for minimum flows is a primary feature of the salmon enhancement program (other features are described in Case Study #55). Under the Davis-Grunsky Grant Agreement, MID guarantees to release between 180 and 220 cfs in the river between November and April. Because the enlargement of Crocker-Huffman Dam was never initiated the storage and releases from New Exchequer provides these required streamflows. Currently the DFG is investigating the need for larger springtime releases for the lower Merced River and this study is described in Case Study Report #55 (Snelling Project).

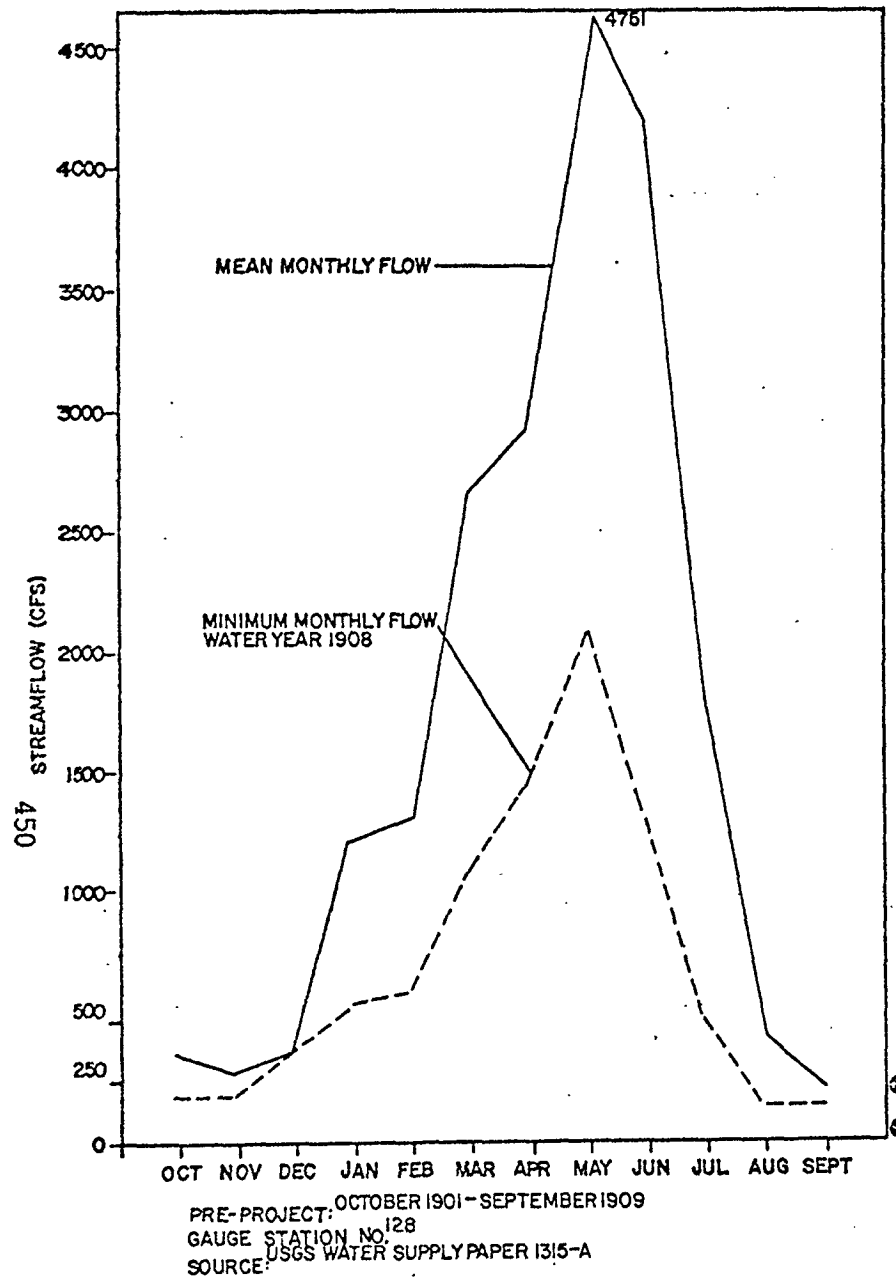
IV. Post-Project

The operation of New Exchequer Dam stabilized the seasonal streamflow patterns by storing a greater amount of peak spring-time discharges for later release in the summer. The mean monthly flows during the period of November through April (the time of required minimum fishflow releases between 180 and 220 cfs below Crocker-Huffman Dam) have been above 300 cfs below Exchequer Dam (see Figure 2). Streamflows recorded by the USGS at Shafter Bridge, 43 miles downstream from the dam, have been above 200 cfs for this same period (November to April) as shown in Figure 3 (this gauge only records low flows). During other months of the year at least 100 cfs is released at New Exchequer to fulfill riparian requirements.

The Merced River between New Exchequer and Crocker-Huffman Dams is managed by the DFG as a catchable trout stream. However, below Crocker-Huffman Dam the stream is utilized by spawning migration of king salmon. The improvement of streamflow conditions and addition of some enhancement features below Crocker-Huffman Dam have partially rehabilitated the king salmon populations (see Case Study Report #55).

V. Conclusions

The operation of the New Exchequer Project has increased the stability of summer and fall streamflows in the Merced River as compared to pre-project levels. The minimum instream flow release requirement established in 1959 of 50 cfs year around is



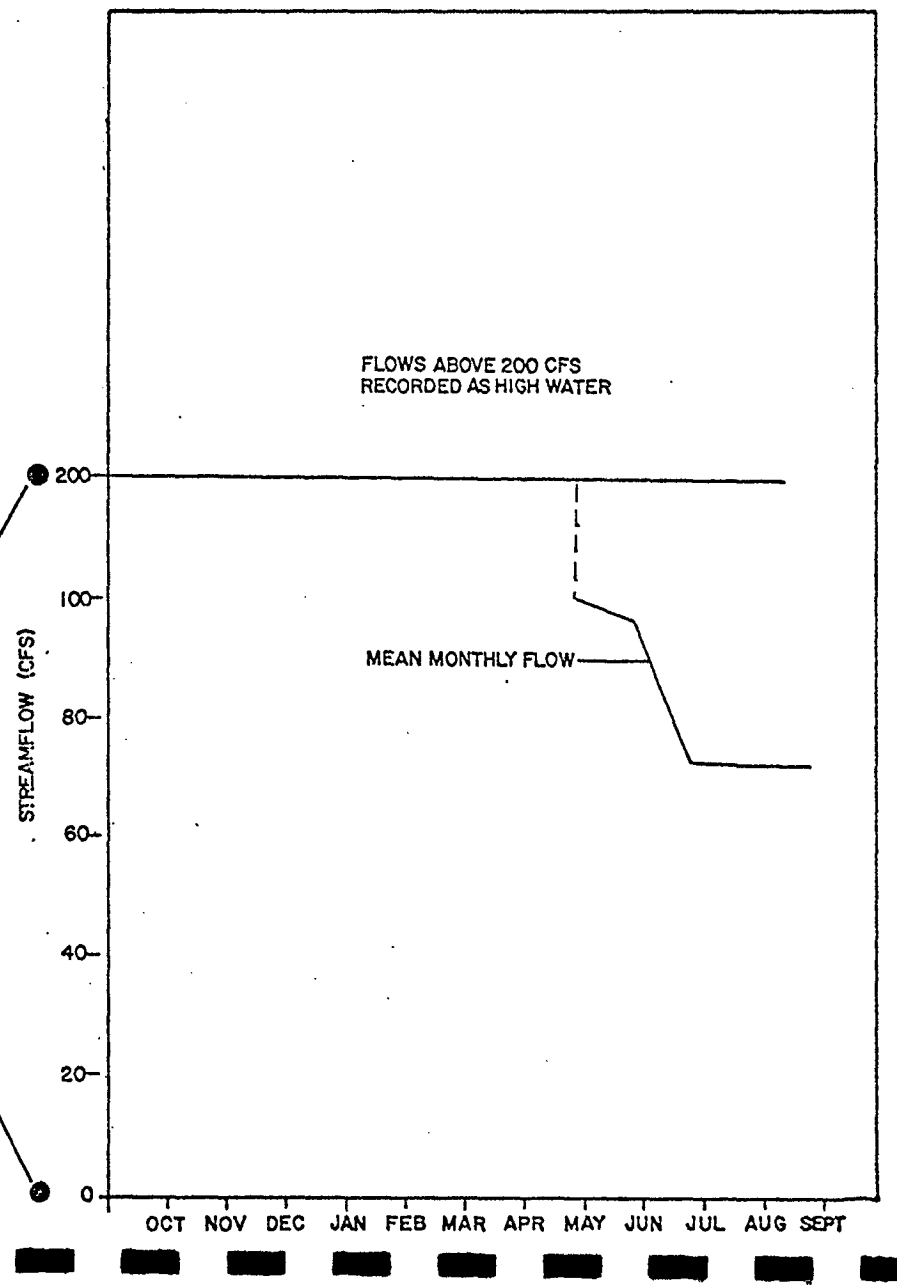


FIGURE 3
STREAMFLOW CONDITIONS, MERCED RIVER AT SHAFFER BRIDGE 43 MILES BELOW CROCKER HUFFMAN DAM

far exceeded by the mean monthly flows shown in Figure 2. The flows for fish and wildlife preservation in the lower Merced River below Crocker-Huffman Diversion is allocated from storage at New Exchequer. The stream discharge below the dam (New Exchequer) must be sufficiently high to supply water demands of the Merced Irrigation District (MID) and provide an average of 200 cfs during salmon spawning season (November through April) in the lower river. A usable width method was used to determine the instream flow needs for the enhancement of king salmon populations in the lower river. (For a further description see Case Study Report #55, Snelling Project.) Post-project salmon populations estimates are greater than pre-project population levels which would indicate that releases from New Exchequer along with the features of the Salmon Habitat Improvement Project below Crocker-Huffman (spawning channel and screened diversions) have effectively maintained king salmon populations.

Currently the DFG is reviewing the spring streamflow schedule and is planning to modify required releases in order to optimize survival and emigration of juvenile salmon below Crocker-Huffman Dam.